CLAIMS

1. A method of estimating the time offsets between signals transmitted by plural transmitters of a communications network and received by a receiver attached to a terminal, the method comprising the steps of

(a) creating a section of a representation of the signals from the plural transmitters received by the receiver at the terminal (a "terminal section");

(b) creating a first section of a representation of the signal transmitted by a first of said transmitters, and creating a second section of a representation of the signal transmitted by a second of said transmitters, each of which sections overlaps in time with the terminal section;

(c) using the first section, the second section and a set of signal parameters, including initial estimates of the time offsets between the first section and the terminal section and between the second section and the terminal section, to create a model of a section of a representation of the composite signal received by the receiver from the first and second transmitters;

(d) comparing the model with the terminal section;

(e) refining the set of signal parameters including the time offset estimates to minimise the difference between said model and the terminal section; and

(f) adopting the time offsets in the refined parameter set used to minimise the difference between said model and the terminal section, as the estimated time offsets between the first section and the terminal section and between the second section and the terminal section.

2. A method according to claim 1, wherein the first section, the second section, and the terminal section are created by sampling the respective signals at sample times according to a predetermined sampling rate.

3. A method according to claim 2, wherein at least the first section is scaled by a first initial complex amplitude value and delayed by a first initial time delay and the second section is scaled by a second initial complex amplitude value and delayed by a second initial time delay, whereafter the scaled and delayed first and a second sections are used to build an adjustable representation (model) of the combined signal from the first and second transmitters received by the receiver, the model of the combined signal from the first and second transmitters received by the receiver is subtracted from the terminal section to produce a time series containing the complex difference at each sample time, and wherein the squares of the amplitudes of the

complex difference at each sample time are added to produce a single real value representative of the overall difference between the model and the target signal or set of signals.

4. A method according to claim 3, wherein the model comprises three, four or more scaled and delayed transmitter sections.

5. A method according to any of claims 1 to 4, wherein the first and second sections are created at the respective first and second transmitters.

6. A method according to any of claims 1 to 4, wherein the first and second sections are created in one or more sampling devices attached to the respective transmitters.

7. A method according to any of claims 1 to 4, wherein the first and second sections are created by computer programs using information supplied from the network about the transmitted signals.

8. A method according to any of claims 1 to 7, wherein the signal representation sections are sent to one or more computing devices in which said estimates are calculated.

9. A method according to claim 8, wherein the terminal location is calculated in said one or more computing devices.

10. A method according to claim 8 or claim 9, wherein the one or more computing devices are in the or another terminal.

11. A method according to any of claims 1 to 10, wherein the section of the representation of the signals received by the receiver at the terminal is recorded in the terminal before being sent to a computing device.

12. A method according to any of claims 1 to 10, wherein the section of the representation of the signals received by the receiver at the terminal is transferred in real time to the computing device and a recording made there.

13. A method of calculating the position of a mobile terminal in a communication network which includes the method according to any of claims 1 to 12.

14. Apparatus for estimating the time offsets between signals transmitted by plural transmitters of a communications network and received by a receiver attached to a terminal, the apparatus comprising

(a) processing means arranged to create a section of a representation of the signals from the plural transmitters received by the receiver at the terminal (a "terminal section");

(b) processing means arranged to create a first section of a representation of the signal transmitted by a first of said transmitters, and to create a second section of a representation of the signal transmitted by a second of said transmitters, each of which sections overlaps in time with the terminal section;

(c) processing means arranged to create a model of a section of a representation of the composite signal received by the receiver from the first and second transmitters using the first section, the second section and a set of signal parameters, including initial estimates of the time offsets between the first section and the terminal section and between the second section and the terminal section;

(d) processing means arranged to compare the model with the terminal section;

(e) processing means arranged to refine the set of signal parameters including the time offset estimates to minimise the difference between said model and the terminal section; and

(f) processing means arranged to adopt the time offsets in the refined parameter set used to minimise the difference between said model and the terminal section, as the estimated time offsets between the first section and the terminal section and between the second section and the terminal section.

15. Apparatus according to claim 14, which includes a sampling device or devices in which the first section, the second section, and the terminal section are created by sampling the respective signals at sample times according to a predetermined sampling rate.

16. Apparatus according to claim 14 or claim 15, wherein at least the first section is scaled by a first initial complex amplitude value and delayed by a first initial time delay and the second section is scaled by a second initial complex amplitude value and delayed by a second initial time delay, whereafter the scaled and delayed first

and a second sections are used to build an adjustable representation (model) of the combined signal from the first and second transmitters received by the receiver, the model of the combined signal from the first and second transmitters received by the receiver is subtracted from the terminal section to produce a time series containing the complex difference at each sample time, and wherein the squares of the amplitudes of the complex difference at each sample time are added to produce a single real value representative of the overall difference between the initial model and the target signal or set of signals.

17. A telecommunications terminal including apparatus for finding the time offsets between signals transmitted by a plurality of transmitters of a communications network and received by a receiver attached to the terminal, the apparatus comprising

(a) processing means arranged to create a section of a representation of the signals from plural transmitters received by the receiver at the terminal (a "terminal section");

(b) processing means for receiving a first section of a representation of the signal transmitted by a first of said transmitters and a second section of a representation of the signal transmitted by a second of said transmitters, each of which sections overlaps in time with the terminal section;

(c) processing means arranged to create a model of a section of a representation of the composite signal received by the receiver from the first and second transmitters using the first section, the second section and a set of signal parameters, including initial estimates of the time offsets between the first section and the terminal section and between the second section and the terminal section;

(d) processing means arranged to compare the model with the terminal section;

(e) processing means arranged to refine the set of signal parameters including the time offset estimates to minimise the difference between said model and the terminal section; and

(f) processing means arranged to adopt the time offsets in the refined parameter set used to minimise the difference between said model and the terminal section, as the estimated time offsets between the first section and the terminal section and between the second section and the terminal section.

18. A communications network for finding the time offsets between signals transmitted by a plurality of transmitters of the communications network and received by a receiver attached to a terminal, the network comprising

(a) a computing device or devices;

(b) a terminal having a receiver attached to the terminal, processing means arranged to create a section of a representation of the signals from plural transmitters received by the receiver at the terminal (a "terminal section"), and means for sending the section to the computing device or devices;

(c) sampling devices associated with respective first and second ones of said transmitters for creating respective first and second sections of representations of the signals transmitted by a first and a second of said transmitters, each of which sections overlaps in time with the terminal section, and for sending the sections of representations to the computing device or devices;

the computing device or devices being adapted to

create a model of a section of a representation of the composite signal received by the receiver from the first and second transmitters using the first section, the second section and a set of signal parameters, including initial estimates of the time offsets between the first section and the terminal section and between the second section and the terminal section;

compare the model with the terminal section;

refine the set of signal parameters including the time offset estimates to minimise the difference between said model and the terminal section; and

adopt the time offsets in the refined parameter set, used to minimise the difference between said model and the terminal section, as the estimated time offsets between the first section and the terminal section and between the second section and the terminal section.

19. A computing device or devices for use in a communications network according to claim 18, the computing device being adapted to

create a model of a section of a representation of the composite signal received by the receiver from the first and second transmitters using the first section, the second section and a set of signal parameters, including initial estimates of the time offsets between the first section and the terminal section and between the second section and the terminal section;

compare the model with the terminal section;

refine the set of signal parameters including the time offset estimates to minimise the difference between said model and the terminal section; and

adopt the time offsets in the refined parameter set, used to minimise the difference between said model and the terminal section, as the estimated time offsets between the first section and the terminal section and between the second section and the terminal section.

20. A computer program or programs comprising computer program code means adapted to perform the steps of the computing device or devices of claim 19.

21. A method of tracking a moving mobile terminal in a communications network, which includes periodically applying the method according to any of claims 1 to 12.